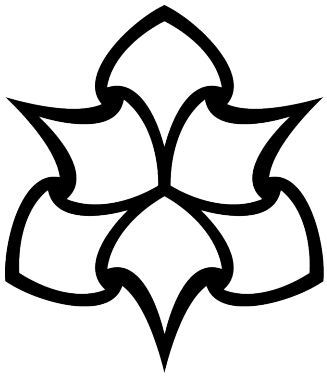

Gender and image sharing on Facebook, Twitter, Instagram, Snapchat and WhatsApp in the UK: Hobbying alone or filtering for friends?[1]

Mike Thelwall, Farida Vis

Purpose: Despite the ongoing shift from text-based to image-based communication in the social web, supported by the affordances of smartphones, little is known about the new image sharing practices. Both gender and platform type seem likely to be important, but it is unclear how.

Design/methodology/approach: This article surveys an age-balanced sample of UK Facebook, Twitter, Instagram, Snapchat and WhatsApp image sharers with a range of exploratory questions about platform use, privacy, interactions, technology use and profile pictures.

Findings: Females shared photos more often overall and shared images more frequently on Snapchat, but males shared more images on Twitter, particularly for hobbies. Females also tended to have more privacy-related concerns but were more willing, in principle, to share pictures of their children. Females also interacted more through others' images by liking and commenting on them. Both genders used supporting apps but in different ways: females applied filters and posted to albums whereas males retouched photos and used photo organising apps. Finally, males were more likely to be alone in their profile pictures.

Practical implications: Those designing visual social web communication strategies to reach out to users should consider the different ways in which platforms are used by males and females to optimise their message for their target audience.

Social implications: There are clear gender and platform differences in visual communication strategies. Overall, males may tend to have more informational, and females more relationship-based, skills or needs.

Originality/value: This is the first detailed survey of electronic image sharing practices and the first to systematically compare the current generation of platforms.

1 Introduction

Visual communication through image sharing is an important modern phenomenon. Exchanging or publishing photographs is quick, simple and usually cheap or free with a smartphone and appropriate apps. In the U.S. and UK, most internet users were posting photos online by 2013 (Duggan, 2013; Dutton, Blank, & Groselj, 2013). In 2016, a quarter of all US adults used image-oriented sites Instagram (28%) or Pinterest (26%), with similar numbers using Twitter (24%), and two thirds (68%) of US adults using Facebook (Greenwood, Perrin & Duggan, 2016). Posting photos is a common activity on the last two sites, even though this was not their original purpose. Despite the frequency of image sharing, relatively little is known about its core attributes: the types of images shared and the types of interactions that they spawn. Moreover, despite evidence of gender differences in social web use (discussed below) and the perceived importance of the visual, little is known about the role of gender within social media image sharing. This is an important omission for social researchers seeking to understand modern communication styles, for marketers seeking to generate successful online campaigns or communication strategies, as

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well as for medical and other professionals assessing the influence of social media strategies on mental health or general wellbeing.

Social media use has evolved over time as new practices take advantage of innovations in smartphones and web technology. Novel interaction genres have emerged, adapted and become ubiquitous. General social network sites like Facebook and the video sharing site YouTube are longstanding examples of popular sites that are embedded into many daily lives and represent a new style of communication and information consumption (Boyd, 2014). Web image sharing has also evolved from requiring a specific site, such as Picasa (formed in 2002), Photobucket (formed in 2003) or Flickr (formed in 2004). For example, Flickr focuses on images and is primarily for organising and displaying pictures (Nov, Naaman, & Ye, 2008). In contrast, general purpose social web sites like Facebook (fully public in 2006) and Twitter (founded 2006 – integrated image sharing via TwitPic 2008-2014), embed image sharing support as a seamless part of a wider communication experience for all users. Newer image-based sites include Instagram for the rapid informal posting of all types of images, and Snapchat for displaying photos for a limited time. Despite this variety, there is little empirical evidence of the different practices that may have emerged within each platform.

This article assesses gender differences in patterns of use for five social media sites: Facebook, Twitter, Instagram, Snapchat and WhatsApp. These were chosen for having substantial numbers of users and image sharing features. Two are intended mainly for image sharing (Snapchat and Instagram) but are very different from the first generation of image sharing sites. In 2016 in the U.S. 79% of online adults used Facebook, 32% used Instagram, 24% used Twitter and 29% used WhatsApp or something similar. In the U.S. in 2003, 9% of smartphone users had a SnapChat app and 18% had an Instagram app. Facebook (social networking), Twitter (instant messaging) and WhatsApp (smartphone only) were chosen as different types of widely adopted platforms used for image sharing. SnapChat (temporary image sharing) and Instagram (long term image sharing and image editing) were chosen as different types of modern popular image sharing site. The purpose is exploratory: to gain broad insights into the role of gender and platform in different types of social web image sharing using a set of key aspects. This can show if the platforms support similar behaviours or if there are important underlying differences. The focus is on sharing frequency, profile pictures, privacy, interaction and technology use. This will inform marketers and other professionals that need to understand image sharing today and will enable future studies to be more targeted. The UK was chosen as an early user of electronic technology and an area with little social web image sharing research. Findings from the UK may therefore both suggest likely general trends and illuminate any obvious contrasts with the U.S.. As reviewed below, there have been no previous in-depth surveys about image sharing, although some have asked general questions or surveyed students about a single platform and some studies have examined specific contexts in detail. This paper therefore addresses a large knowledge gap about an important current social phenomenon.

2 Background

This section discusses insights into social web image sharing from multiple perspectives and then focuses on the main analysis themes to lead into the research questions. As additional background information about the two image-specific platforms, in 2013, similar numbers of female (10%) and male (9%) mobile phone owners in the U.S. used Snapchat. More female (20%) than male mobile phone owners in the U.S. (16%) used Instagram in 2013

(Duggan, 2013), a difference that continued between online U.S. females (38%) and males (26%) in 2016 (Greenwood, Perrin & Duggan, 2016). Facebook users in the U.S. are more likely to be female (83% of online women) than male (75% of online women) (Greenwood, Perrin & Duggan, 2016). There is little difference for Twitter, however (females: 25% of those online in the U.S.; males: 24%) (Greenwood, Perrin & Duggan, 2016). In contrast, male U.S. smartphone users (31%) are more likely to have a messaging app like WhatsApp than are females (28%) (Greenwood, Perrin & Duggan, 2016). In the UK, and perhaps elsewhere, posting photographs to the social web associates with high general social web use rather than being a separate phenomenon (Dutton, Blank, & Groselj, 2013).

2.1 Social web image sharing

Personality type Most published academic studies of social web image sharing have analysed the relationship between personality type and public images for U.S. college students, typically using a standard questionnaire to elicit personality type, and sometimes also investigating gender. More narcissistic students have Facebook profile photographs that seemed to be vainer and more self-promoting and made them appear to be more attractive (156 U.S. undergraduates on a single course in 2007; only narcissism was investigated: Buffardi & Campbell, 2008). More neurotic students post images to Facebook more often and more agreeable females post more than less agreeable females but there was no difference for males (237 undergraduates at one Israeli university department in 2008/9: Amichai-Hamburger, & Vinitzky, 2010). Neuroticism and extraversion also predicted more Facebook photo uploading in another study and found that more agreeable users received more likes and comments on their photos (mainly undergraduates at a UK university in 2012/13: Eftekhar, Fullwood, & Morris, 2014). Selfies may also reveal the owner's personality traits (505 random Sina Webo microblog users: Qiu, Lu, Yang, Qu, & Zhu, 2015).

Uses and gratifications The uses and gratifications framework can be used to analyse reasons why people share or interact with photographs. Social web users probably have narrow uses for photo sharing that are important to them but rare overall, such as posting funeral images on Instagram (Gibbs, Meese, Arnold, Nansen, & Carter, 2015) or ultrasound scans (Leaver & Highfield, in press). Image sharing seems to be commonly used for flirting on SnapChat (Utz, Muscanell, & Khalid, 2015), and to declare or emphasise relationships (Salimkhan, Manago, & Greenfield, 2010 Saslow, Muise, Impett, & Dubin, 2013).

Privacy Users with privacy concerns are less likely to share photos on Facebook (378 Facebook users: Malik, Hiekkanen, Dhir, & Nieminen, 2016).

Image types Facebook using college students seem to primarily upload happy photographs of themselves with their friends (Facebook profiles of 63 students at a U.S. university from four ethnic groups: Zhao, Grasmuck, & Martin, 2008; confirmed in: Mendelson & Papacharissi, 2010). Parties, couples and single gender groups of friends are common themes for U.S. college students. On Twitter, photographs are the most commonly shared type of image, typically of one or a few people. Screenshots and hybrid or layered images are also sometimes shared (randomly selected U.K. and U.S. images from a week in 2014: Thelwall, Goriunova, Vis, Faulkner, Burns, Aulich, et al., 2016). On Instagram, the most common images are selfies (24%), friends (22%), activities (15%), gadgets (11%), food (11%), pets (3%) and fashion (3%) (20 recent photos from each of 50 regular active users connected to popular accounts Hu, Manikonda, & Kambhampati, 2014).

News and politics News and political images are shared on social media, but presumably by a minority of users. Tweeted images were important in the 2011 Egyptian revolution (Kharroub & Bas, 2016) and the 2012 Israel-Hamas conflict (Seo, 2014) but politics is rare in UK and US tweeted images (Thelwall et al., 2016). Instagram is also used for photojournalism (Alper, 2014).
Comments on images Commenting on an image allows people to relive happy moments with their friends (Mendelson & Papacharissi, 2010).

2.2 Gender and images in the social web

There is evidence of a range of gender differences in image sharing practices. A study of Israeli undergraduates found no gender difference in the number of pictures uploaded to Facebook in 2008/9 (Amichai-Hamburger, & Vinitzky, 2010). An investigation of a selected sample of Facebook users with at least 1000 followers found that males were more motivated by the pleasures of photo sharing as a habitual pastime and disclosing personal information than were females. No gender differences were found for affection, attention seeking, entertainment, information sharing, social influence, and social interaction (402 users found by browsing a Suggested Groups page in the site in 2014: Malik, Dhir, & Nieminen, 2016). Female students are more likely to have informal pictures of themselves relaxing with friends (89 Facebook using U.S. college students: Mendelson & Papacharissi, 2010). Male adolescents tagging photos (i.e., with other users' identities) are more likely to value Likes and comments on photos than are female adolescents, and are more likely to want to gain popularity through them. In contrast, the study found no gender difference for social sharing and affection, as well as for entertainment, social influence, peer pressure, feel good and convenience (780 pupils aged 12-18; mainly at private English speaking schools in India in 2013 and two other samples: Dhir & Torsheim, 2016).

2.3 Gender and social web image posting frequency

For Facebook-using U.S. college students, females post more photos (n=333: Mendelson & Papacharissi, 2010) and have more photos of themselves on their profiles (89 Facebook using U.S. college students: Mendelson & Papacharissi, 2010). In the U.S. in 2013, more women (54%; males: 48%) posted photographs to the web (Duggan, 2013), showing that the gender difference is not restricted to students. The gender difference is much higher for sharing others' images. For U.S. internet users in 2013, half (49%) of women did this in comparison to a third (36%) of men (Duggan, 2013).

2.4 Gender and social web profile images

On Facebook, female users change their profile image more frequently whereas males are more likely to appear alone (Strano, 2008). The tendency for females to appear more often with others in profile pictures appears to have persisted over time and across cultures on Facebook (Tifferet & Vilnai-Yavetz, 2014) and therefore may be an important gender difference. Young females may also post more revealing profile pictures (Kapidzic & Herring, 2015).

There are cultural differences in the styles of profile images (Zhao & Jiang, 2011) and so findings from one country may not generalise to others.

2.5 Privacy, gender and image sharing

Privacy can be important on the social web, including for images. One privacy-related strategy is for someone to untag themselves from a Facebook photograph posted by others so that their friends are less likely to see it. Untagging may be the result of the picture showing the user in an unattractive light, with an undesired social group, or doing an activity that others may disapprove of, and has been found to be more frequent for females than for males in one study (Strano & Queen, 2013) but not another (Lang & Barton, 2015). There seem to be few differences in overall privacy-related general social web behaviours, however (e.g., for U.S. teens: Madden, Lenhart, Cortesi, Gasser, Duggan, Smith, & Beaton, 2013).

2.6 Interaction, gender and image sharing

Females tag more photos (333 Facebook using U.S. college students: Mendelson & Papacharissi, 2010) and have more comments on their photos (89 Facebook using U.S. college students: Mendelson & Papacharissi, 2010).

2.7 Technology, gender and image sharing

Nothing seems to be known about gender differences in technology use to support social media image sharing.

3 Research questions

The research questions are descriptive and exploratory rather than theory driven. Previous findings about images and gender in the social web, as reviewed above, motivate some of the questions but their purpose is to frame a discussion of the results rather than to test theory-based predictions. This is appropriate because this study seeks differences between types of social web site overall rather than in any specific detail.

1. Are there gender differences in **image sharing frequency**? Does the answer vary by platform and image type? This is the most basic image sharing question: how often does it occur?
2. Are there gender differences in the **profile pictures** used by image sharers? Does the answer vary by platform? Profile pictures are the key images shared by users and therefore important to investigate.
3. Are there gender differences in **privacy** concerns related to image sharing? Does the answer vary by platform? There are known gender differences in online privacy concerns and the platforms have substantially different privacy issues that may affect who shares images and how, so this is an important issue.
4. Are there gender differences in the frequency of **interactions with others' images**? Does the answer vary by platform? Although image sharing does not necessarily involve interaction, it is useful to study interaction because there are known gender differences in online communication strategies and platform differences in the ways in which images can be interacted with.
5. Are there gender differences in **technology use** to help image sharing? Does the answer vary by platform? Technology use is apparently important for Instagram, and so it would be helpful to know whether it is a special case in this regard.

4 Methods

The overall research design was to generate a large sample of people in the UK that are active social media image sharers, ask them a range of questions about their platforms of choice, and use statistical hypothesis testing for evidence of gender differences.

4.1 Questionnaire Sample

The sampling goal was to gain a large age-balanced sample of active social media image sharers for each platform to assess typical users. Since students form an unusual group of highly active internet users (at least in the UK: Dutton, Blank, & Groselj, 2013), their use was ruled out, contrasting with most of the studies discussed above. Similarly, any kind of convenience sampling based on friends or discussion group postings would be likely to attract an unbalanced sample of the population. Since methods to access large samples of the population are expensive and time consuming to generate, a specialist commercial organisation was hired for this stage, Face Group in the UK. It uses a variety of methods to encourage members of the public to complete questionnaires. These typically involve allocating reward points to users of a particular service (e.g., mobile phone, supermarket) for completing a questionnaire. This is possible via an agreement between the survey company and the loyalty card owners. This approach has biases towards people that are willing to complete questionnaires and that sign up for loyalty cards. Invitations to participate typically arrive in the form of a mobile phone loyalty card app alert. User biases can be offset to some extent using quotas in the screening stage.

Each person responding to the questionnaire invitation in an app was asked for their age, gender and social media platforms used to share images. Users were rejected if they did not use at least two of the five platforms for image sharing or if their age/gender/platform choices were above pre-set quota levels. The purpose of the two platform restriction was to ensure sufficiently large sample sizes for each platform but it gives a bias towards broader social media users. Quotas were set for each platform to get approximately equal gender representation (for statistical power) and age representation (at least 40% over 34 on each platform to avoid domination by young users). Each selected respondent was asked general questions as well as questions about two of the social media sites that they had selected. The survey was conducted October-November, 2016. Recruitment was difficult for Snapchat, leading to lower numbers for this service. The final sample sizes were: Facebook: 295; Instagram: 260; Twitter: 295; Snapchat: 130; WhatsApp: 294. About half (52%) were female (1 did not declare a gender) and 1274 completed the questionnaire overall.

A major disadvantage of this method is that it is not transparent due to the lack of specific statistics about the numbers and types of people that have received the survey invitation but it seems to be a reasonable method to get a large sample of almost exclusively smartphone users from the UK public.

4.2 Questions

A range of questions was devised for each research question. When appropriate, identical questions were set for multiple platforms, but platform-specific questions were also asked to get insights into unique types of use. The questions were informed by previous research, as discussed above, as well as from personal experience of using the sites for image sharing. As an example of the latter, the Instagram question, “What are your THREE most popular

filters, if you use filters?" was added after observing that filters appeared to be widespread in this site. A lengthy exploratory survey was used to aid the task of gaining early descriptive insights into the role of gender in image sharing on different platforms. There are too many questions (83, some of which are multi-part) to describe in detail the rationale for each one.

The wording and design of each question was pilot tested with other researchers, leading to many changes overall to improve clarity. The question wording was examined repeatedly to check for possible misinterpretations or other common question formatting errors (Saris & Gallhofer, 2014). For instance, this led to usage frequency questions being given a specific duration to reduce ambiguity (e.g., "How often during the past month, have you posted the following image types?") The most controversial question was Q34T GIFs (see Appendix). Although from a computer science perspective GIF is a file format, in the social web the term GIF is used to denote a short animated image. Since this was not a key question, the wording was kept simple in the belief that most users would interpret it using the non-technical understanding. The formatting of the questions on the platform used to deliver them was also tested. The questions used are listed in the Appendix.

4.3 Analysis

Pearson chi-square tests were used for cases where males and females were compared across two or more non-ordinal categories. A Yates continuity correction was used for all 2x2 cases. The chi-square test assesses whether there is a gender bias in the table and the difference between observed and expected values was used to infer the direction of the influence. For ordinal answers, a Mann-Whitney U test was used to assess whether one gender tended to be associated with higher values. This is a non-parametric test that works by comparing the average rank of the male answers with the average rank of the female answers.

Standard hypothesis testing procedures are used rather than the confidence interval approach (e.g., Cumming, 2012) for convenience of reporting many results. Since a large number of tests are included, there is a reasonable chance that some results are incorrect even though the chance of falsely rejecting the null hypothesis, if it is true, is guarded at 0.05 for each individual test. The overall family-wise probability of rejecting at least one null hypothesis, assuming that they are all true, is high. This could be protected against with a Bonferroni correction (Perneger, 1998) but this was avoided because this study aims to give wide ranging insights into likely gender and platform differences rather than definitive and robust evidence. The word "much" is used in the results section to signal results with $p<0.01$ having stronger statistical backing.

5 Results

The results are described for each research question separately. Each discussion starts with general queries asked of all survey participants and then discusses platform-specific issues.

5.1 Image sharing frequency and type

Females posted their own photos more than did men (Q6r1: chi-square 4.00, $p=0.045$) and considered the ability to do this from their mobile phone to be more important than did men (Q7r1: Mann-Whitney U, $p=0.034$). The frequency of image sharing varies by platform with neither gender being consistently more prolific. Whilst male image sharers post more

often on Twitter (S3r3: Mann-Whitney U, p=0.012) and female image sharers post more often on Snapchat (S3r4: Mann-Whitney U, p=0.041), there is no statistical evidence of a gender difference for Facebook (S3r1: Mann-Whitney U, p=0.291), Instagram (S3r2: Mann-Whitney U, p=0.537) and WhatsApp (S3r5: Mann-Whitney U, p=0.439).

Image posting frequency has gender differences that vary by image type (Table 1). Although the table only shows statistically significant results and an absence of statistical evidence does not imply that there is no difference, Table 1 suggests that male image sharers are more active posters of pictures of hobbies and work, whereas female image sharers more actively post pictures of friends and family, selfies and pets.

Table 1: How often during the past month, have you posted the following image types? The specified gender performs the activity more (Q27, Q36, Q46, Q64, Q78; Mann-Whitney $p<0.05$). If no gender is specified, then there is insignificant statistical evidence of a difference (Mann-Whitney $p>0.05$).

Image subject	**Facebook**	**Twitter**	**Instagram**	**SnapChat***	**WhatsApp**
Yourself (including selfies)				**Female (selfies)**	
Friends and family			**Female**		
Your children (ages 0-12)				NA	
Holidays and places to visit		**Male**			
Parties and celebrations					
School/Uni/college or at work	**Male**				
Hobbies/leisure activities		**Male**	**Male**	NA	
Pets and animals				**Female**	
Food or beverages		**Male**		**Female**	
Celebrities/popular culture				NA	
Humorous				NA	
News/current affairs				NA	

*NA: Question was not asked. SnapChat questions were phrased differently from the others.

Twitter: Male Twitter image sharers post still images more on Twitter (Q34Tr1 Mann-Whitney U, p=0.034) but no gender difference was found for GIFs (Q34Tr2 Mann-Whitney U, p=0.100) and Videos (Q34Tr3 Mann-Whitney U, p0.058).

5.2 Profile pictures

Female social web image sharers are more likely to have a profile picture with others whereas males are more likely to have a more standard passport photograph, although this may vary by platform and Snapchat has its own profile picture format, framing the user within its ghost logo.

Facebook: Females are much more likely to have a profile picture with others and males are much more likely to have a passport style photograph (Q23F chi-square 28.162; p=0.002).

Twitter: No gender difference in profile picture preference was found (Q35T chi-square 9.451; p=0.490).

Instagram: No gender difference in profile picture preference was found (Q45I chi-square 12.973; p=0.225).

WhatsApp: Females are more likely to have a profile picture with friends and males are more likely to have a passport style photograph (Q76W chi-square 21.74; p=0.016).

5.3 Privacy

There are some overall differences in the extent to which males and females value privacy for image sharing, as well as the frequency with which they take privacy-related actions. Female image sharers were much more likely to have untagged themselves in photos shared by other people (Q6r10: chi-square 8.079; p=0.004), but no gender difference was found in users cropping themselves out of photos (Q6r9: chi-square 0.178; p=0.730), deleting previously posted photos (Q6r5: chi-square 1.248; p=0.264), or requesting others to remove photos (Q6r6 chi-square 0.005; p=0.943). Females were also much more likely to value the ability to delete images from a social media platform than were males (Q7r4: Mann-Whitney U, p=0.010) and there was no gender difference in the importance of being able to request a platform to remove an image (Q7r5: Mann-Whitney U, p=0.058) or of images disappearing after a set period of time (Q7r6: Mann-Whitney U, p=0.372).

Sharing images of children provokes particular privacy concerns and there was no gender difference found in the amount of image sharing of children (Q7a chi-square 0.693; p=0.405) but women were much more open to the possibility of sharing images of their children (Q7b chi-square 23.327; p=0.000).

Instagram: Males were much more likely to have public Instagram profiles (Q43I chi-square 12.560; p=0.002).

Snapchat: Public Snapchat image sharing is an intrinsically more private than Facebook, Instagram and Twitter because of the automatic disappearance of images. Users can bypass this feature by saving Snapchat content and/or reposting it elsewhere, which has privacy implications. Females were more likely to take screenshots (Q67S chi-square 4.497; p=0.034) and to post Snapchat images to other social media (Q69S chi-square 5.121; p=0.024). There were no gender differences in concerns about others saving images for later use (Q68S chi-square 0.161; p=0.688) or internet leaks of them (Q70S chi-square 2.963; p=0.230). More females valued receiving private snaps than males (Q62Sr2 Mann-Whitney U, p=0.008) but no difference was found in valuing the sending of private snaps (Q62Sr1 Mann-Whitney U, p=0.074).

WhatsApp: WhatsApp is a private platform in that it is oriented towards existing friends and does not post content to the public web. No gender differences were found in WhatsApp activities or concerns, including sharing images without permission (Q79W chi-square 1.759; p=0.185), finding out that others had shared the user's images without permission (Q80W chi-square 4.206; p=0.122), downloading a chat history (Q81W chi-square 0.854; p=0.355), concerns about others downloading a chat history without permission (Q82W chi-square 0.038; p=0.845), and concerns about Facebook accessing WhatsApp data (Q83W chi-square 3.744; p=0.154).

5.4 Interactions

There are gender differences in the extent to which image posting can lead to interactions with other users. Female image sharers were much more likely to comment on others' photos (Q6r3 chi-square 29.083; p=0.000) and on their own photos (Q6r4 chi-square 11.801; p=0.001) but there was no gender difference in sharing others' photos (Q6r2 chi-square 0.367; p=0.545). There was also no gender difference in the importance of the ability to see others' shared photos on a mobile phone (Q7r2 Mann-Whitney U, p=0.355) or the value of images as evidence that something had happened (Q7r3 Mann-Whitney U, p=0.159).

Facebook: More females liked posts (including images) than males (Q21Fr3 Mann-Whitney U, p=0.038) but neither gender commented more on others' photos (Q21Fr4 Mann-Whitney U, p=0.683).
Twitter: Neither gender considered others liking and commenting on their photos to be more important (Q37T Mann-Whitney U, p=0.127).
Instagram: More female users were concerned for others to Like or comment on their photos (Q47I Mann-Whitney U, p=0.032). No gender differences were found in the frequency of a wide range of Instagram activities involving others, including commenting (Q44I.Ar4 Mann-Whitney U, p=0.883), liking (Q44I.Ar5 Mann-Whitney U, p=0.166) and reposting other's photos (Q44I.Ar3 Mann-Whitney U, p= 0.330).

5.5 Technology use and image editing

There are gender differences in the use of apps to edit images, although neither gender consistently used more. Male image sharers were more likely to download Snapseed (Q11r8 chi-square 7.07; p=0.008), whereas females were more likely to download Facetune (Q11r2 chi-square 9.686; p= 0.002) or Layout from Instagram (Q11r4 chi-square 6.714; p= 0.010). No gender differences were found for Afterlight (Q11r1 chi-square 2.061; p=0.151), GiphyCam (Q11r3 chi-square 3.642; p=0.056), Perfect 365 (Q11r5 chi-square 1.953; p=0.162), Photo Editor by Aviary (Q11r6 chi-square 1.388; p=0.239), Pic Stitch (Q11r7 chi-square 0.65; p=0.420), Timelapse from Instagram (Q11r11 chi-square 0; p=1), and VSCOCam (Q11r12 chi-square 0; p=1).

Males were much more likely than females to download many image organising apps, including Flickr (Q12r3 chi-square 12.112; p=0.001), Focus (Q12r4 chi-square 7.308; p=0.007), Google Photos (Q12r6 chi-square 16.489; p=0.000), and Piktures (Q12r8 chi-square 8.485; p=0.004) but not Carousel (Q12r1 chi-square 0.009; p=0.924), Everalbum (Q12r2 chi-square 1.473; p=0.225), FStop Media Gallery (Q12r5 chi-square 0.026; p=0.827), Photosynch (Q12r7 chi-square 3.642; p=0.056), Quickpic (Q12r9 chi-square 0.934; p=0.334) and Tidy (Q12r10 chi-square 1.918; p=0.166). No gender differences were found for the Facebook Moments (Q13 chi-square 0; p=1) and Facebook Photosync (Q26F chi-square 0; p=1) apps.

Females were much more likely than males to apply filters to photos (Q6r8 chi-square 31.394; p=0.000) and males were more likely to or retouch/alter photos before posting them (Q6r7 chi-square 4.37; p=0.037) but there was insufficient evidence to conclude that either gender was more likely to convert analogue images to post them (Q6r11 chi-square 0.073; p=0.787).
Facebook: Females were much more likely to have posted to a Facebook album in the previous year (Q25F chi-square 10.552; p=0.001) but neither gender was more likely to have created one (Q24F chi-square 1.54; p=0.463).
Instagram: Females were much more likely to apply filters than were males (Q48Ir3 chi-square 9.179; p=0.002), but no evidence was found of gender differences at a more fine-grained level (Q48Ir1-2,4-10 chi-square; p>0.05).
Snapchat: Females were much more likely to apply filters than were males (Q63Sr1 chi-square 7.165; p=0.007) and to add text to images, but no evidence was found of gender differences with using doodles (Q63Sr3 chi-square 0; p=1), stickers (Q63Sr6 chi-square 0.029; p=0.864), emojis (Q63Sr5 chi-square 0.091; p=0.763) or lenses (Q63Sr2 chi-square 2.802; p=0.094).

6 Discussion

The results are subject to a number of limitations. The sample only covers the UK and use patterns are likely to vary substantially by country. The sampling method is biased towards people that sign up for loyalty cards and are willing to complete a survey for a small reward. Given this incentive, it is possible that the respondents did not answer the questions carefully, although the existence of platform and gender differences for a number of tests is evidence that this was not universal, even though it may have occurred to some extent. Related to this, the survey answers are self-reported and subjective rather than objective measures of the phenomena investigated. The survey requirement to use two platforms also biases the survey towards broader social media users. The age-balanced sample allows overall comparisons between genders and platforms but there are also likely to be substantial age differences. The statistical results are likely to include some false conclusions due to the large number of statistical tests conducted and the lack of a Bonferroni family-wise correction. The hypothesis testing approach used to help organise the results is misleading to some extent because in some cases statistically significant gender differences were found for some platforms but not others because similar test statistics fell on either side of the critical value. Finally, the study quantitative methodology is not capable of giving insights into how social media image sharing relates to wider communication strategies or the specific function of image sharing for typical users.

Image sharing frequency and type (Section 5.1): In contrast to previous (old) findings for U.S. college students on Facebook that females post images more frequently (Mendelson & Papacharissi, 2010) UK females only posted more frequently on SnapChat, whilst UK males posted more frequently on Twitter. Thus, contradicting this earlier evidence, *frequent image posting is not an intrinsically gendered activity, except on specific platforms*. The platform differences are presumably caused by their different uses in practice (e.g., Twitter more informational, SnapChat more personal or social). This overlaps with the trend for *females to post more relationship-oriented photos (e.g., friends and family, pets) and for males to document information more (e.g., holidays and places to visit, food, work, hobbies)* (Table 1). It aligns with a previous finding that females were more likely to use a general social network site (MySpace) for friendship than were males (Thelwall, 2008). The broad pattern echoes a tendency for males to adopt a more informational style of communication, and females a more involved style in text (Argamon, Koppel, Fine, & Shimoni, 2003; Biber, Conrad, & Reppen, 1998). Taken together, the two suggest *underlying gender differences in fundamental communication goals* that transcend either text or images. Given this extra evidence, it seems likely that the image sharing frequency results would be echoed in the U.S. and many other countries with similar (e.g., Western-influenced) cultural backgrounds.

Profile pictures (Section 5.2): The greater (UK) female tendency to have a profile picture with others in Facebook and WhatsApp reflects the tendency to post relationship-oriented photos discussed above. It extends previous international findings for Facebook (Tifferet & Vilnai-Yavetz, 2014) to UK WhatsApp users. The lack of a statistically significant difference for Twitter and Instagram suggests that the relationships are less important for platforms that do not focus on them, such as Twitter (informational). Instagram is harder to characterise: one small study found many selfies posted to it (Manikonda, & Kambhampati, 2014) but it seems likely to be less for interpersonal communication than Facebook and WhatsApp due to its focus on images. Taking this account, *displaying relationships in profile*

pictures is important for females on relationship-centred platforms like Facebook and WhatsApp.

Privacy (Section 5.3): There was a slight tendency for (UK) females to conduct more activities to protect their privacy by preferring more private platforms (e.g., Snapchat) and controlling others' photographs. This agrees with the greater female overall online privacy concerns (Sheehan, 1999). Nevertheless, more females claimed potentially invasive activities, such as saving or reposting Snapchat content to circumvent its automatic disappearance. This aligns with a previous findings of little relationship between privacy concerns and behaviour in the web (for females: Sheehan, 1999) or social web (Taddicken, 2014). The most noteworthy privacy-related gender difference found here was that *more females valued controlling pictures with untagging or deletion* (cross-platform question), extending a previous conclusion about untagging in Facebook (online survey question from 2008) and contradicting a later similar survey (Strano & Queen, 2013; c.f. a convenience/snowball sample of 112 Facebook users: Lang & Barton, 2015). These may be particularly visual phenomena and related to the greater social pressure on females for their personal appearance (Burton, Netemeyer, & Lichtenstein, 1995; which may translate into actions: Rui, & Stefanone, 2013).

Interactions (Section 5.4): UK females interacted with images more frequently than did UK males in terms of commenting on and liking them, although gender differences at the platform level are only evident for Facebook Likes. This extends previous findings for U.S. college students on Facebook seven years ago (tagging and profile comment counts: Mendelson & Papacharissi, 2010) to the UK and a more general population. Thus, *liking images is a female-oriented activity on Facebook* and *commenting and liking images may be female oriented overall*.

Technology (Section 5.5): There were many differences in technology use by gender, with UK males using image organising apps more and UK females using image formatting apps more. Female users were also more likely to apply filters to images than were males overall, as well as on several individual platforms. Thus, *the overall trend is for males to organise images and females to enhance them*. These findings are the first of their type so are not compared to other results. Female image modification may reflect the greater social pressure on females for their appearance (Burton, Netemeyer, & Lichtenstein, 1995), assuming (without evidence) that the filtered images were typically of people.

7 Conclusions

The results show that there are gender differences in aspects of image sharing and these vary by platform. Males and females therefore adjust their communication styles to platforms, but in different ways. Thus, people designing social media communication strategies and seeking to take advantage of the visual for enhanced effect should consider customising their message for both platform and gender. For example, messages targeting women may need to be more interactive and use filters whereas males may be more susceptible to informational or hobby-based images.

The few gender differences for WhatsApp suggest that this platform is less influenced by gender than the others, at least for image sharing. This might be because the system is inherently more friend-based, which constrains the likely types of communication that users may engage in.

Finally, although this should not be exaggerated, the results are broadly consistent with males tending to have more individualistic and informational communication needs or

skills that are expressed visually, when appropriate, on platforms with cultures and affordances that support them. Conversely, females may have more relationship-based communication skills or needs that are also expressed visually, when appropriate, on platforms with cultures and affordances that support them. These high level differences are presumably socially constrained choices rather than biologically determined imperatives.

In terms of future work, social media use is constantly evolving and the sites studied here are likely to fall out of favour at some time in the future and to be replaced by new platforms with innovative offerings. In this context, the current results should be seen as a snapshot from 2016 and comparisons with future studies may reveal how gender differences are evolving over time. Future more detailed research would also be useful to find out why the gender differences occur. For example, what are the underlying reasons that female image sharers use filters more often?

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10 Appendix: Questions asked

- Q1 How old are you now?
- Q2 To which gender identity do you most identify?
- Q3. On average, during the past year, how often have you posted images on these two social media platforms? Facebook; Instagram; Twitter; Snapchat; WhatsApp.
- Q17 What type of smartphone do you have?
- Q6 Which of the following activities have you engaged in on social media during the last 12 months?
    - Posted photos that you have taken
    - Shared photos that other people have taken and posted
    - Commented on photos that other people have taken and posted

    - Commented on photos that you have taken and posted
    - Deleted photos that you have taken and posted
    - Requested that others take down images that they have posted
    - Retouched or altered photos that you have taken (before posting them)
    - Used filters on photos that you have posted
    - Cropped yourself out of your own photos before posting them
    - Untagged yourself in photos that other people have posted
    - Posted photos that were not originally digital
    - Reposted photos that you had posted previously
- Q7a Did you or do you post images of your children on social media (any time from when they were born to 12 years old)?
- Q7b Would you post images of your children on social media (any time from when they were born to 12 years old)?
- Q7.1 Please indicate the extent to which you agree with the following statements.
    - Being able to post photographs from my mobile phone to social media is important to me.
    - The ability to see images shared by others on social media on my mobile phone is important to me.
    - Photographs shared on social media are useful evidence that something has happened.
    - The ability to delete my images from a social media platform myself is important to me.
    - The ability to ask a platform to take an image down if requested is important to me.
    - The ability for an image to automatically disappear from a platform after a set period of time is important to me.
- Q11 Which of the following apps have you downloaded (on a mobile device, laptop or desktop)?
- Q12 Which of the following apps do you use on your phone to organise and store your images?
- Q13 Do you use the Facebook Moments app to share images with friends and family?
- Q16 How do you access the social media platforms you have an account with?
- Q18F When did you first sign up for Facebook?
- Q19F How many people are you friends with on Facebook?
- Q20F Who can see your posts on Facebook?
- Q21F On average during the past year, how often did you engage in the following activities?
    - Change or update your status on Facebook
    - Post images on Facebook (
    - Click the like button next to other people's status, photos, links or other posts on Facebook
    - Comment on other people's photos on Facebook
- Q22F How important to your use of Facebook are the following?
    - Receiving updates and comments from the people in your network
    - Seeing photos and videos posted by the people in your network
    - Being able to share something with many people at one time

    - Being entertained by funny things people share or post
    - Receiving support from people in your network
    - Keeping up with news and current events
- Q23F What kind of profile picture do you currently have on Facebook?
- Q24F In the last 12 months, have you created one or more Facebook albums?
- Q25F In the last 12 months, have you posted images to a Facebook album?
- Q26F Have you allowed Facebook access to your smartphone camera roll by activating Photosync?
- Q27F How often during the past month, have you posted the following image types?
    - Images of yourself (including selfies)
    - Images of friends and family
    - Images of your children (ages 0-12)
    - Images of holidays and places to visit
    - Images of parties and celebrations (incl. birthdays and weddings)
    - Images at School/Uni/college or at work
    - Images relating to your hobbies/leisure activities
    - Images of pets and animals
    - Images of food or beverages
    - Images of relating to celebrities/popular culture
    - Humorous images (including memes)
    - Images related to the news/current affairs
- Q28F How important it is that people like and comment on your images that you have posted on Facebook?
- Q29T When did you first sign up for Twitter?
- Q30T How many followers do you have on Twitter?
- Q31T How many accounts do you follow on Twitter?
- Q32T Who can see your posts on Twitter?
- Q33T How important to your use of Twitter are the following?
    - To be alerted to or find out more about breaking news
    - To see images of breaking news events
    - To keep up with the news in general
    - To pass the time
    - To tell others what I am doing and thinking about
    - To keep in touch with people I know
    - To follow famous people and public figures
    - To share news (from different news sources)
    - To network
    - To follow trending topics
- Q34T How often do you post the following media on Twitter?
    - Still Images
    - GIFs
    - Videos
- Q35T What kind of profile picture do you currently have on Twitter?
- Q36T How often during the past month have you posted the following image types on Twitter?
    - Images of yourself (including selfies)
    - Images of friends and family

    - Images of your children (ages 0-12)
    - Images of holidays and places to visit
    - Images of parties and celebrations (incl. birthdays and weddings)
    - Images at School/Uni/college or at work
    - Images relating to your hobbies/leisure activities
    - Images of pets and animals
    - Images of food or beverages
    - Images related to gifts/items purchased/want to purchase
    - Humorous images (including memes)
    - Images related to the news/current affairs
- Q37T How important it is that people like and comment on your images that you have posted on Twitter?
- Q38T Have you ever seen a graphic image in your Twitter feed that you were offended by?
- Q39T Have you ever searched for images and found a graphic image in the results that you were offended by?
- Q40I When did you first sign up for Instagram?
- Q41I How many followers do you have on Instagram?
- Q42I How many accounts do you follow on Instagram?
- Q43I Who can see your posts on Instagram?
- Q44I.A For your most used Instagram account, how often do you engage in the following activities?
    - Check your timeline on Instagram
    - Post a picture on Instagram
    - Repost a picture from other accounts
    - Comment on other people's images
    - Like a picture someone else has taken
    - Check trending photos on Instagram
    - Check photos curated by Instagram
    - Search for photos on Instagram
    - Share Stories on Instagram
- Q44I.B How important to your use of Instagram are the following?
    - My friends are using it
    - To see and provide visual status updates for friends and family
    - To exchange images with other users on Instagram
    - To create beautiful photographs
    - To improve my photography skills
    - o document the world around me
    - The feed is purely visual (shows no text)
    - It's a creative outlet
    - To get inspired and pick up ideas
    - Sense of community (incl. Instameets)
    - To follow famous people and public figures
    - To follow brands
- Q45I What kind of Instagram profile picture do you currently have?
- Q46I How often during the past month, have you posted the following image types?
    - Images of yourself (including selfies)

    - Images of friends and family
    - Images of your children (ages 0-12)
    - Images of holidays and places to visit
    - Images of parties and celebrations (incl. birthdays and weddings)
    - Images at School/Uni/college or at work
    - Images relating to your hobbies/leisure activities
    - Images of pets and animals
    - Images of food or beverages
    - Images related to gifts/items purchased/want to purchase
    - Humorous images (including memes)
    - Images related to the news/current affairs
- Q47I How important it is that people like and comment on your images that you have posted on Instagram?
- Q48I What types of alterations do you typically make to your images before you import them into Instagram?
- Q49I What types of alterations, if any, do you typically make to your images in Instagram itself before posting them?
- Q50I. What are your THREE most popular filters, if you use filters?
- Q51I. For taking selfies, what are your TWO most popular filters, if any?
- Q52I For taking pictures of food, what are your TWO most popular filters, if any?
- Q53I For taking nature pictures, what are your TWO most popular filters, if any?
- Q54I For taking art & design and fashion pictures, what are your TWO most popular filters, if any?
- Q55S When did you first sign up for Snapchat?
- Q56S How many accounts have you added as friends on Snapchat?
- Q57S How many accounts are following you on Snapchat?
- Q58S Do you follow anyone on Snapchat that you don't know personally?
- Q59S How often do you use Snapchat?
- Q60S What is your Snapchat score?
- Q61S Do you ever take snaps mainly to try to improve your Snapchat score?
- Q62S How important to your use of Snapchat are the following?
    - Sending private snaps
    - Receiving private snaps
    - Posting Snapchat Stories
    - Watching Snapchat Stories
    - Contributing to Live Stories
    - Watching Live Stories
    - Using Discover to find Channels
- Q63S What do you typically do to an image before you send it on Snapchat?
- Q64S What kinds of things do you take pictures of to send on Snapchat?
- Q65S What have you done on Snapchat today?
- Q66S What have you done on Snapchat in the last week?
- Q67S Have you ever taken screenshots of images sent to you on Snapchat to save them?
- Q68S Are you concerned about other people saving your snaps and storing them for later use?

- Q69S Have you ever posted or shared Snapchat images on other social media platforms or messaging apps?
- Q70S Are you worried that your Snapchat images could be leaked on the Internet?
- Q71W When did you first sign up for WhatsApp?
- Q72W How often do you use WhatsApp?
- Q73W How important to your use of WhatsApp are the following?
    - Sending private messages
    - Receiving private messages
    - Sending messages to small groups
    - Receiving messages from small groups
    - Sending messages to large groups
    - Receiving messages from large groups
- Q74W What types of communication do you engage in on WhatsApp and with whom?
- Q75W Do you share images on WhatsApp with any of these individuals or groups?
- Q76W What kind of WhatsApp profile picture do you currently have?
- Q77W Is your profile picture different on WhatsApp compared to the picture you mainly use on social media accounts?
- Q78W Now thinking of all your WhatsApp communication together, how often during the past month have you posted the following image types?
    - Images of yourself (including selfies)
    - Images of friends and family
    - Images of your children (ages 0-12)
    - Images of holidays and places to visit
    - Images of parties and celebrations (incl. birthdays and weddings)
    - Images at School/Uni/college or at work
    - Images relating to your hobbies/leisure activities
    - Images of pets and animals
    - Images of food or beverages
    - Images related to gifts/items purchased/want to purchase
    - Humorous images (including memes)
    - Images related to the news/current affairs
- Q79W Have you ever shared an image that someone shared with you on WhatsApp on another social media platform without their permission?
- Q80W Has someone, that you communicated with on WhatsApp, ever shared one of your images on another social media platform without your permission?
- Q81W Have you ever downloaded a WhatsApp chat history?
- Q82W Are you concerned about others downloading your chat history without your permission?
- Q83W Are you concerned about Facebook using WhatsApp data under WhatsApp's updated terms of service (August 2016)?